International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 4, May-June 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Performance Evaluation of Power Tiller and its Attachments for Mechanizing Rice Cultivation in Eastern Uttar Pradesh

Amit Agarwal[1], VB Singh[2], SS Kashyap[3], AK Singh[4]

[1]Subject Matter Specialist (Ag.Eng.), [2]Assistant Professor/SMS,
[3]Subject Matter Specialist (AGB), [4]Senior Scientist & Head
[1, 2, 3, 4]KVK (Sant Kabir Nagar), A.N.D. University of Agriculture and Technology, Ayodhya, Uttar Pradesh, India

ABSTRACT

Many lessons have been learned since agricultural mechanization was first introduced and adopted across many regions. Eastern UP can apply and learn from the drawbacks and achievements in other countries in its efforts to devise and implement a sustainable agricultural development strategy for the future. Such a strategy can enhance and improve development outcomes and sustainability, support further development of agro-industries, and increase scientific and technological innovation and capabilities, while pursuing coordinated urban and rural economic development. This paper focuses on and analyzes mechanization strategies and case studies in postharvest and mechanization that have been carried out over several decades to address differing conditions in countries and their policies towards their rice mechanization systems. As such, the emphasis is on the technologies, policies, practices, strategies, and models that relate to different parts of mechanization systems within specific regions. However, while many mechanization drivers and needs differ from one place to another, a wide range of mechanization elements can be transferred to suit local aspects and conditions in new locations. Furthermore, success stories can help in conceptualizing time and decision-making needs, and can also avoid the drawbacks that have appeared in some countries' mechanization systems, with the goal of leading to faster and more adequate adaptation of different technologies and policies in various implementation stages.

How to cite this paper: Amit Agarwal | VB Singh | SS Kashyap | AK Singh "Performance Evaluation of Power Tiller and its Attachments for Mechanizing Rice Cultivation in Eastern Uttar Pradesh" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-4, June 2021, pp.1163-1165, URL: www.ijtsrd.com/papers/ijtsrd42551.pdf

IJTSRD42551

Copyright © 2021 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (http: //creativecommons.org/licenses/by/4.0)

INTRODUCTION

There is no consensus on the definition of mechanization, and even when specialists agree on a definition, they sometimes disagree about whether or not it fits particular needs. The term "mechanization" describes the introduction of tools, implements, and machinery for improving the productivity of farm labor and of land; it may use either human, animal, or motorized power, or a combination of these. In practice, therefore, mechanization involves the provision and use of all forms of power sources and mechanical assistance for agriculture, from simple hand tools to draught animal power to mechanical power technologies. Hence, agricultural mechanization is the application of mechanical technology and increased power to agriculture, largely as a means to enhance the productivity of human labor and often to achieve results well beyond the capacity of human labor. This includes the use of tractors of various types, internal combustion engines, electric motors, renewable energy, and other methods of energy conversion. Based on the source of power, the technological levels of mechanization have been broadly classified as hand-tool technology, draught animal technology, and mechanical power technology. Mechanization also includes irrigation systems, food processing, and related technologies and equipment.

Mechanization is not an "all or nothing" process. Levels and types of improved mechanical technologies need to be appropriate, that is, compatible with local, agronomic, socioeconomic, environmental, and industrial conditions. Hence, agricultural mechanization can be defined as the development, introduction, and use of mechanical assistance of all forms and at any level of technological sophistication in agricultural production. Agricultural mechanization can more simply be defined as the use of any machine to accomplish a task or an operation involved in agricultural production. Such tasks or operations include reduction in human drudgery, improvement in the timeliness and efficiency of various agricultural operations, bringing more land under cultivation, preserving the quality of agricultural products, providing better rural living conditions, and markedly advancing economic growth. As a relationship among humans, machines, and materials, Mechanization is the interjection of machinery between people and the materials handled by them.[1] Agriculture materials are soil, water, environment, seed, fertilizer, pesticides, growth regulators, irrigation, agricultural produce, as well as by-products such as food grains, oilseeds, fruits, vegetables, cotton, sugarcane and other cash crops, milk, meat, eggs, fish, etc. There is scope for mechanization in every operation in production agriculture, postharvest and agro processing, and rural living. [2] In the developed world, mechanization tends to be synonymous with automation. In developing countries, mechanization means any improved tool, implement, machine, or structure that assists in enhancing workers' output; multiplies human effort; and/or supplements or substitutes for human labor that is enabling and eliminates

drudgery or stresses that adversely affect human health and mental faculties, leading to errors, imprecision, hazards, and loss of efficiency.[3]

The general pattern for the adoption and growth of mechanization is found to be similar in most countries worldwide. Historically, it usually started with farm operations requiring high power inputs and low levels of control (e.g., tillage, transport, water pumping, milling, threshing). From there, farm operations requiring medium levels of power and control were mechanized (e.g., seeding, spraying, intercultural operations). Farm operations in eastern UP requiring a high degree of control and low power inputs were usually mechanized last (e.g., transplanting). That is because any power-intensive work can be replaced relatively easy using readily available mechanical means like internal combustion engines and at a reasonably low cost, whereas converting human knowledge into machine capacity is often more difficult and costly.[4]

Some specific constraints are poor quality of equipment; lack of common components and standard designs of equipment; acute shortage of equipment testing facilities; and lack of education, training, and popularization of farm equipment among end-users. This is often caused by inadequate training facilities for farmer-users, tradesmen, and artisans; inadequate service centers; and lack of regulations on custom hiring services, e.g., custom farm work agreement, workplace safety, environment matters.[5]

DISCUSSION

Mechanization is also driven by various other factors including socioeconomic conditions, farming systems, population density, government policy, rural labor wages, and farmer support for agricultural mechanization .These are some of the factors that explain why some countries mechanize faster than others. In short, the introduction of agricultural technology, including mechanization, consists of complex processes and drivers. The formulation of an agricultural mechanization strategy therefore requires comprehensive knowledge of many aspects of agriculture in its broadest sense. An agricultural mechanization strategy very much depends on country-specific characteristics of the economy and level of agriculture sector development. Recent examples show that mechanizing agriculture can be pursued and processes can be planned for in the way that serves a eastern UP areas. [6]

Any country can follow and/or adapt to fit its needs and formulate its own strategy to achieve the required level of mechanization. Hence, network institutions should be identified and activities should be defined along with these stages to be implemented in each area of eastern UP. Another important issue is whether farmers are able to invest in agricultural machinery when commercial agriculture is promoted, which constitutes the start of a positive path leading to mechanization. Animal power is an appropriate technology at the initial stage of mechanization, when farmers have small areas to cultivate under subsistence agriculture regimes. At the beginning of the mechanization development process, machines are basically owned by individual farmers. To increase utilization rates of privately owned machinery, custom hiring services can be provided to neighboring farmers even with animal power or small machinery in this early stage. If custom hiring services prove profitable, then it is viable to invest in larger (or more) machinery to cover larger areas. The key issue is the profitability of mechanized farming. To promote sound mechanization, all stakeholders, such as manufacturers, distributors, service providers, operators, and farmers, need to make a profit from mechanized farming. Reducing machinery costs is an important issue that all stakeholders should always seek. A minimum input of machinery to a unit area, as in conservation agriculture, is one of the alternatives to reduce machinery costs.[7]

In addition, moving toward environmentally mechanized sustainable agriculture increases access to environmentally sound agricultural machinery that both sustains and enhances rural livelihoods and reduces pressure on natural resources, which are the lifeblood for producing food. This also offers farmers a broader range of technology choices at the right price to increase agricultural productivity, provide food security, and reduce postharvest losses. For example, many Asian countries can benefit from agricultural mechanization strategies by identifying and increasing farmers' access to more viable postharvest technologies such as rice dryers to reduce their losses.

RESULTS

Smallholders' contribution to the total value of agricultural output is significant in many areas of the eastern UP region. For example, in India their contribution to total farm output exceeds 50%, although they cultivate only 44% of the land. Many studies also confirm an inverse relationship between farm size and productivity. Small farmers are characterized by smaller applications of capital but higher use of labor and other family-owned inputs, and a generally higher index of cropping intensity and diversification. The inverse relationship between farm size and productivity is a powerful rationale for land reform policies, including land redistribution for both efficiency and equity gains. Experience has shown that Asian countries, such as India, that promoted small family farms were able to launch the Green Revolution. Mechanization in rice farming was and will remain a common concern within individual countries, within a geographic region, and across countries. Even with the variations in situations and conditions, and the differences in objectives and procedures in each nation, lessons derived from others can guide and strengthen implementation of a suitable agricultural mechanization system in the eastern UP region. Along with what has been mentioned earlier about case studies and information from different countries, important lessons and experiences from the literature can be summarized as follows:[8]

Many lessons learned and experiences from eastern UP may be good references or benchmarks for policy makers in developing countries:

A. Interactions of public-private partnerships and collective initiatives are considered crucial to agricultural innovation and diffusion, and should be facilitated in a way that supports better mechanization options within the country. [9]

B. Economic growth is the key factor that contributed to the growth of paddy farm mechanization in eastern UP, as farmers became affluent and were able to buy their own machinery to save on labor costs. In addition, as farmers became older, and because younger generations preferred jobs in cities and factories, the use of sophisticated machinery became a necessity in farming for ease of operations and reduced drudgery.

C. The mechanization of other crops (e.g., vegetables) was based essentially on approaches made for mechanizing rice production such that most machinery for other crops on the farm is based on designs originally made for rice.[10]

D. Land consolidation projects and government loans greatly promoted mechanization. They also resulted in a negative effect—overinvestment—but contributed greatly to the formation of net income. However, efforts as in an irrigation-drainage project contributed more to an increase in consumption and saving levels, rather than to an increase in agricultural investment or mechanization.

CONCLUSION

Also, many lessons from the PRC's mechanization system and from India could be useful in formulating the Eastern UP agricultural mechanization strategy, among them:

1. Hosting international farm machinery exhibitions led to attracting foreign machinery companies and created interest among local firms and technical circles, beside awareness of mechanization in government bodies.
2. There are many more lessons and successful stories from around the world that cannot be covered in one paper. It is also important to consider developmental issues in rice mechanization. [11]
3. Different rice technology transfer strategies have been tried in the eastern UP e.g., information management, training and extension, supporting agents and manufacturers, focused R&D, government policies, credit facilities, and many plans to insure a better transition and implementation of a highly standardized agricultural mechanization strategy.[12,13]
4. It is clear that the eastern UP needs to continue towards a higher level of mechanization in rice farming.[14]

REFERENCES

[1] Agricultural Year Book. 2012. General Surveys: Agricultural Mechanization, Information Center, Center for International Cooperation Services, Ministry of Agriculture, PRC.

[2] Alam, A. 2006. Future requirements of agricultural machines for mechanizing agriculture. Status of farm mechanization in India. Report, Indian Council of Agricultural Research, India. Pp 175–196.

[3] APCAEM (Asian and Pacific Centre for Agricultural Engineering and Machinery). 2009. 5th APCAEM Technical Committee Meeting and Expert Group Meeting on Application of Agricultural Machinery for Sustainable Agriculture, Philippines, 14–16 October 2009.

[4] Azogu, I. I. 2009. Promoting Appropriate Mechanization Technologies for Improved Agricultural Productivity in Nigeria: The Role of the National Centre for Agricultural Mechanization. Journal of Agricultural Engineering and Technology, Vol. 17(2), pp. 5–10.

[5] BAC (Business Analytic Center). 2011. Farm Machinery Market in Thailand: Business Report 2011. Merchant Research and Consulting, Ltd. Corner Chambers, 590A Kingsbury Road, Birmingham, United Kingdom. Pp 1–70. Accessible by order through: http://www.researchandmarkets.com/reports/1554562/

[6] Bagheri, N. and S. A. Moazzen. 2009. Optimum strategy for agricultural mechanization development in Iran. Journal of Agricultural Technology, Vol. 6 (1), pp. 225–237.

[7] Barker, R., R. W. Herdt, and B. Rose. 1983. The Asian Rice Economy. Resources for the Future, Washington, D. C. Biggs, S. and S. Justice. 2011.

[8] Rural Development and Energy Policy: Lessons from Agricultural Mechanisation in South Asia, ORF Occasional Paper #19. Observer Research Foundation. New Delhi, India.

[9] China Statistical Yearbook. 2011. China Statistics Press, National Bureau of Statistics, Jia 6, Xisanhuan Nanlu, Fengtai, Beijing 100073, People's Republic of China.

[10] Chiu, Y. C., Fon, D. S., and L. H. Chen. 1998. A simulation model of a seeding system for rice nursery. Journal of Agricultural Engineering Research 69:239–248.

[11] Chung, Sun-Ok. 2005. Agricultural mechanization and postharvest technology in Korea. Presentation, first sessions of the Governing Council and the Technical Committee of APCAEM held in New Delhi, India, 21–24 November 2005. Available at: http://www.unapcaem.org/Activities%20Files/A21/Korea.pdf CIGR (International Commission of Agricultural Engineering). 1999.

[12] CIGR Handbook of Agricultural Engineering. Volume III: Plant Production Engineering. Published by the American Society of Agricultural Engineers. LCCN 98-93767, ISBN 1-892769-02-6. Pp. 536–554.

[13] Clarke, L. J. 2000. Strategies for Agricultural Mechanization Development: the Roles of the Private Sector and the Government. Agricultural Support Systems Division, Food and Agriculture Organization of the United Nations, Rome, Italy.

[14] Davis, G. W., Bailey, D. V., and K. M. Chudobac. 2010. Defining and Meeting the Demand for Agricultural Machinery in China: A Case Study of John Deere. International Food and Agribusiness Management Review Volume 13, Issue 3. Pp. 97–120.